

Records of Little-Known Sharks from Australian Waters

A. J. BASS

Communicated by J. R. PAXTON

BASS, A. J. Records of little-known sharks from Australian waters. *Proc. Linn. Soc. N.S.W.* 103 (4), (1978) 1979: 247-254.

Chlamydoselachus anguineus, *Hemipristis elongatus*, *Cirrhigaleus barbifer*, *Centroscymnus crepidater* and *Centroscymnus owstoni* are recorded from Australia for the first time, illustrated and briefly described. A further record of *Hexanchus griseus* is noted.

A. J. Bass, National Museum of New Zealand, Private Bag, Wellington, New Zealand; manuscript received 22 March 1978, accepted in revised form 13 December 1978.

INTRODUCTION

The shark fauna of Australia is not well known and many species often go unrecognized due to a lack of readily available descriptions. This paper attempts a partial remedy by recording and describing several obscure but possibly quite abundant species. Terminology and methods are as described in Bass *et al.* (1976). All study material is in the collections of the Australian Museum, Sydney (AMS) and the Western Australian Museum, Perth (WAM).

Family CHLAMYDOSELACHIDAE

Chlamydoselachus anguineus Garman 1884

Chlamydoselachus anguineus Garman 1884: 47, figs (type locality: Japanese seas).

Study material: 1315 mm mature male (AMS I.19157-001) trawled from 512-585 m of water off Brush Island, New South Wales (35°35-29'S, 150°44-47'E), F.R.V. "Kapala", 9 June 1976.

This specimen is illustrated (Fig. 1) and its proportional dimensions summarized (Table 1). A vertebral count was not attempted as the lack of calcification in *Chlamydoselachus* renders most of the centra invisible in radiographs. The teeth number 13-13/12-1-12. Distinguishing features include the blunt snout, elongate body, single dorsal fin, anal fin, distinctive tricuspid teeth which are similar in the upper and lower jaws, and six gill-slits, of which the first pair are joined across the throat.

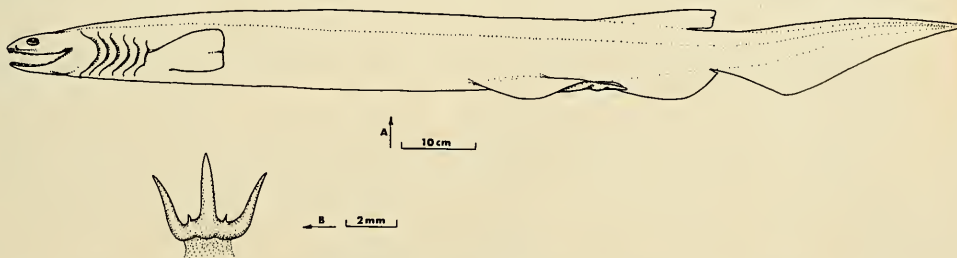


Fig. 1. 1315 mm mature male *Chlamydoselachus anguineus* (AMS I.19158-001). A — lateral view, B — tooth from near centre of lower jaws.

Stead (1907) recorded *Chlamydoselachus* from New South Wales on the basis of a skull with part of a vertebral column measuring over three metres in length. I agree with Whitley (1940) that this identification is highly doubtful. First described from Japanese seas where it is relatively common, *C. anguineus* has also been caught in the north-eastern Atlantic on several occasions and twice off California (Roedel and Ripley, 1950). The only definite records from the southern hemisphere are of two sharks trawled at different times off South West Africa (Smith, 1967; Bass *et al.*, 1975b). To these may now be added the record from New South Wales.

Family HEXANCHIDAE

Hexanchus griseus (Bonnaterre 1788)

Squalus griseus Bonnaterre 1788: 663 (type locality: Mediterranean).

Study material: Jaws of a 4250 mm, 348 kg female (AMS I.19110-001) caught on a bottom long-line in 420 m of water off Norah Head, New South Wales (33°15'S, 152°15'E), J. Dulhunty, 6 June 1976.

No detailed measurements of this shark are available as only the jaws were preserved. The tooth count is 18-19/9-VI-1-VI-8, the Roman numerals referring to the large multicuspid teeth found in the lower jaws of all hexanchid sharks. This group is distinguished by the presence of six or seven gill-slits (all widely separated across the throat), an anal fin, a single dorsal fin, and markedly different teeth in the upper and lower jaws. Of the four currently accepted species, *Notorynchus cepedianus* (Peron 1807) and *Heptranchias perlo* (Bonnaterre 1788) are relatively common and well known in Australian waters. *Heptranchias dakini* Whitley 1931 is a synonym of *H. perlo* (see Garrick and Paul, 1971a). The third species, *Hexanchus griseus* (Bonnaterre 1788), was first noted in Australian waters by Stead (1963) and then described and figured by Lynch (1964) on the basis of a 219 cm male caught in Victoria. The present study material constitutes the second definite record of *H. griseus* from Australia, for some of Stead's specimens may have belonged to the fourth species, *Hexanchus vitulus* Springer and Waller 1969. A demersal shark of warm waters, *H. vitulus* has been recorded in the western Atlantic — Gulf of Mexico region, the south-western Indian Ocean and the Philippines (see Bass *et al.*, 1975b). In case of doubt the following key should serve to identify all four hexanchid species.

Key to species of the family HEXANCHIDAE

- | | | |
|---|--|-------------------------------|
| 1 | Six gill-slits | 2 |
| — | Seven gill-slits : | 3 |
| 2 | Lower jaws with five rows of large teeth on each side; dorsal fin height about twice anal height; mouth width about $1\frac{1}{2} \times$ mouth length
..... | <i>Hexanchus vitulus</i> |
| — | Lower jaws with six rows of large teeth on each side; dorsal fin height about $1\frac{1}{2} \times$ anal height; mouth width more than twice mouth length
..... | <i>Hexanchus griseus</i> |
| 3 | Snout sharp, its length more than $1\frac{1}{2} \times$ distance between nostrils; body plain, without any small dark or white spots
..... | <i>Heptranchias perlo</i> |
| — | Snout blunt, its length much less than $1\frac{1}{2} \times$ distance between nostrils; upper surface of body with numerous small dark or white spots
..... | <i>Notorynchus cepedianus</i> |

Family CARCHARHINIDAE

Hemipristis elongatus (Klunzinger 1871)

Dirrhizodon elongatus Klunzinger 1871: 665 (type locality: Red Sea).

Study material: 656 mm immature male (WAM P.24547) from Exmouth Gulf, Western Australia ($22^{\circ}10'S$, $114^{\circ}20'E$), D. Heald, 6 July 1973; head and one pelvic fin of 1250 mm mature male (AMS I.19438-005) taken in a gill-net in 1-6 m of water off Lizard Island, Queensland ($14^{\circ}40'S$, $145^{\circ}27'E$), Australian Museum party, 1-12 November 1975.

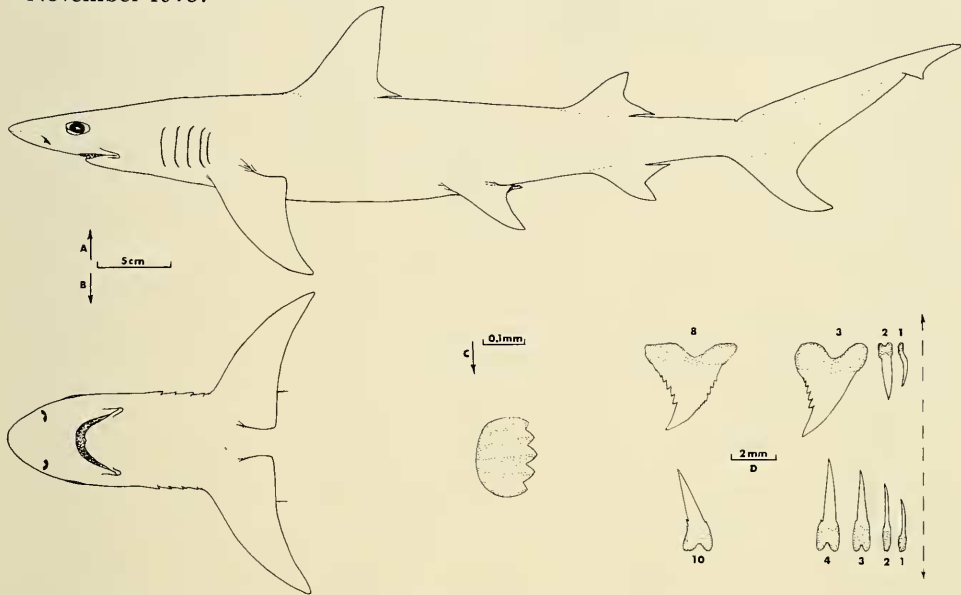


Fig. 2. 656 mm immature male *Hemipristis elongatus* (WAM P.24547). A — lateral view, B — ventral view, C — denticle from side below first dorsal fin, D — teeth from right side of upper jaws. Dashed line indicates position of symphyses; numbers indicate position of tooth rows counting from centre of jaws.

The smaller of these two specimens is illustrated (Fig. 2) and its proportional dimensions summarized (Table 1). Vertebrae number 51 monospondylous in 101 precaudal and a total of 187. The teeth number 14-14/17-17 (13-13/16-16 in the larger shark). Colour (in alcohol) is a pale greyish brown, lighter ventrally, with no conspicuous markings on the fins. The head of the mature male (also in alcohol) is dark grey dorsally, pale cream below. *H. elongatus* is usually described as having spiracles which is not the case with the present study specimens. An interdorsal ridge is variously described as present or not (see Bass *et al.*, 1975a). A definite ridge is present on the anterior half of the interdorsal space of the smaller of the two Australian sharks. Identification is based on the following suite of characters: distinctive teeth (Fig. 2D); definite upper and lower lip grooves; internal nictitating lower eyelids; first dorsal origin approximately over inner pectoral corner; second dorsal fin about half as high as first dorsal, its origin anterior to the anal fin origin; anal fin slightly shorter than second dorsal fin; caudal peduncle without lateral ridges; precaudal pits present (the lower pit may be faint); caudal fin with a distinct lower lobe and subterminal notch; and falcate pectoral and pelvic fins, especially the latter which have acutely pointed tips to the lateral lobes.

The Australian fauna includes a number of carcharhinid sharks, many of them poorly known and usually not identified correctly. The specimens described above constitute the first record of *Hemipristis elongatus* from Australia. Previous records range from southern Africa and Madagascar north to the Red Sea and east to Vietnam.

TABLE 1
Summary of proportional dimensions, shown as percentages of total length

	<i>C. anguineus</i> 1315mm male	<i>H. elongatus</i> 656mm male	<i>C. barbifer</i> 704mm female	<i>C. crepidater</i> 338mm male	<i>C. owstoni</i> 975mm female
Snout to outer end nostrils	0.8	3.8	2.7	3.6	1.5
inner end nostrils	0.9	4.0	3.7	5.0	3.1
mouth	0.2	7.2	7.8	14.5	7.7
eye	2.1	6.3	5.0	10.7	5.2
spiracle	—	—	10.1	18.3	11.8
1st gill-slit	8.0	16.3	16.3	24.3	17.2
pectoral origin	14.7	21.5	18.3	27.8	20.9
1st dorsal origin	61.3	29.0	30.1	34.6	29.7
pelvic origin	48.5	49.5	51.7	58.3	61.5
upper caudal origin	76.4	76.5	79.5	77.5	81.0
Horizontal eye diameter	1.4	2.4	4.0	5.9	2.6
Spiracle length	—	—	1.7	2.1	1.1
Upper ends 1st to last gill-slits	6.7	5.5	3.0	3.8	3.5
1st to 2nd dorsal origins	—	30.5	30.8	28.4	34.3
Pectoral to pelvic origins	33.7	25.9	33.2	33.1	41.5
Pelvic to anal origins	12.2	17.1	—	—	—
Pelvic to lower caudal origins	—	—	26.6	14.8	17.4
Anal to lower caudal origins	13.2	14.2	—	—	—
Last dorsal to upper caudal origins	15.1	17.1	17.8	16.6	17.0
Nostril length	0.7	1.5	2.4	2.7	1.6
Distance between inner ends nostrils	3.3	4.0	3.7	4.1	3.6
Mouth width	7.6	5.6	7.8	6.2	6.7
Mouth length	6.4	4.1	—	—	—
Upper lip groove	—	1.4	1.1	5.6	2.2
Lower lip groove	—	0.9	2.1	1.8	3.1
1st gill-slit	6.3	4.1	2.6	1.2	2.3
3rd gill-slit	5.4	4.0	2.7	1.5	2.1
Last gill-slit	4.3	2.9	2.3	1.2	1.7
1st dorsal height	2.6	9.3	8.8	3.8	2.7
base	10.0	10.4	8.9	8.9	12.8
posterior lobe	2.6	2.6	5.0	6.2	5.6
2nd dorsal height	—	4.4	8.0	4.4	4.4
base	—	7.2	9.5	8.9	10.2
posterior lobe	—	2.3	4.5	7.4	5.8
Anal height	4.2	3.5	—	—	—
base	12.6	6.4	—	—	—
posterior lobe	1.4	2.4	—	—	—
Pectoral base	3.5	4.7	4.8	4.7	5.1
inner edge	5.2	4.6	7.2	6.5	5.6
length	8.2	15.9	13.9	11.5	12.7
Pelvic anterior edge	6.8	9.5	8.1	7.4	9.8
origin to tip	12.8	8.2	11.6	10.1	15.4
Caudal upper lobe	23.8	29.4	21.2	23.4	19.6
lower lobe	8.3	11.6	11.5	12.4	12.8
Subterminal notch to caudal tip	4.4	7.0	—	4.1	5.9

Family SQUALIDAE

Cirrhigaleus barbifer Tanaka 1912

Cirrhigaleus barbifer Tanaka 1912: 151, pl. 141, figs 156-162 (type locality: Tokyo market, Japan).

Study material: 704 mm female (AMS I.19154-001) trawled from 494 m of water off Brush Island, New South Wales (35°34'S, 150°45-46'E), F.R.V. "Kapala", 6 July 1976.

This shark is illustrated (Fig. 3) with the proportional dimensions summarized (Table 1). Definite keels are present on the caudal peduncle while the caudal fin lacks any trace of a subterminal notch. No marked precaudal pits are present but a faint shallow notch at the upper caudal origin could be construed as an incipient (or vestigial) precaudal pit. Vertebrae number 50 monospondylous in 85 precaudal and a total of 114. The teeth number 13-14/12-12. Colour (when freshly dead) dark grey above, white below, the fins with white trailing edges accentuated by somewhat darker colouring adjacent to the white edges.

C. barbifer, distinguished by extremely long nasal barbels and by a lack of precaudal pits, was known only from two Japanese specimens until Garrick and Paul (1971b) recorded three from New Zealand and noted the existence of at least four others from Japan. The example from off Brush Island represents the first record from Australia.

Garrick and Paul (1971b) commented on the close similarities between *Squalus* and *Cirrhigaleus* but regarded the latter as valid. Bass *et al.* (1976) pointed out that the recently described *Squalus asper* Merrett 1973 bridges the gap between the two genera and concluded that they should probably be merged. For the present, however, I retain the genus *Cirrhigaleus* while emphasizing its close relationship with *Squalus asper*.

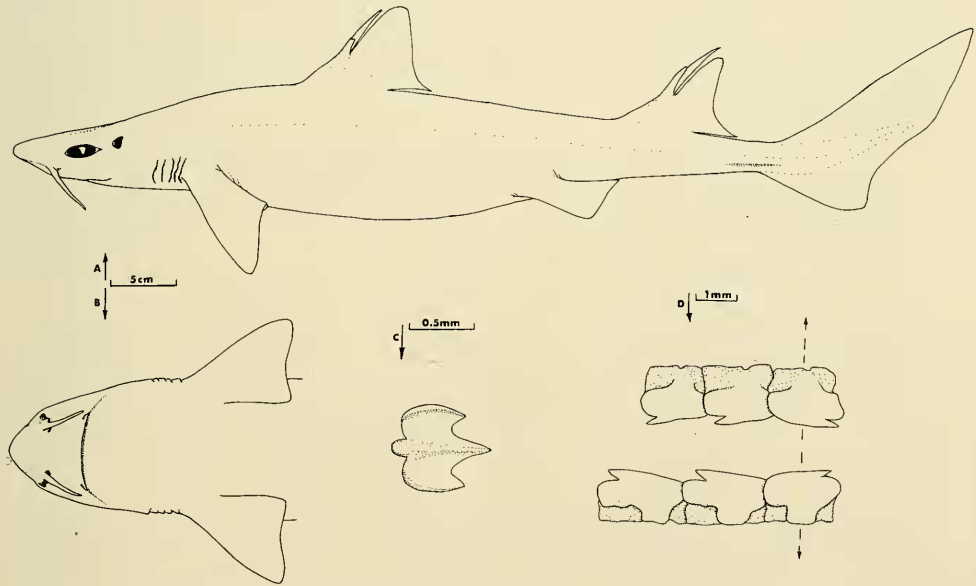


Fig. 3. 704 mm female *Cirrhigaleus barbifer* (AMS I.19154-001). A — lateral view, B — ventral view, C — denticle from side below first dorsal fin, D — teeth from right side of upper jaws. Dashed line indicates position of symphyses.

Genus *Centroscymnus* Bocage and Capello 1864

Four genera of Squalinae have laterally grooved fin spines and unicuspid teeth that are dissimilar in the upper and lower jaws. They are best distinguished by the characters used in the following key (after Bass *et al.*, 1976).

Key to some genera of the subfamily SQUALINAE

- 1 Distance from snout to mouth longer than that from mouth to pectoral origin *Deania* Jordan & Snyder 1902
 — Distance from snout to mouth equal to or less than that from mouth to pectoral origin 2
- 2 Upper teeth set close together, at least some of the bases overlapping to form an interlocking band *Centrophorus* Muller & Henle 1837
 — Upper teeth set apart, the bases not overlapping to form an interlocking band 3
- 3 Upper teeth midway along either side of upper jaws distinctly longer than those towards centre; denticles of adults with a long median ridge, without a conspicuous median cavity *Scymnodon* Bocage & Capello 1864
 — Upper teeth midway along either side of upper jaws not distinctly longer than those towards centre; denticles with median ridge absent or restricted to posterior part, with a conspicuous median concavity *Centrosymnus* Bocage & Capello 1864

Genus *Centrosymnus* Bocage and Capello 1864

Centrosymnus, as defined above, was not known from the southern hemisphere until Garrick (1959a) recorded two species in New Zealand. *Centrosymnus crepidater* (Bocage and Capello 1864) has since been taken off Namibia (Pinchuk and Permitin, 1970) while *C. owstoni* Garman 1906 has been caught in the south-western Indian Ocean (Forster *et al.*, 1970). The occurrence of these two sharks in Australian waters is therefore not unexpected. The species are distinguished according to the following key.

Key to Australian species of the genus *Centrosymnus*

- 1 Preoral clefts almost meeting in the midline of the upper jaws . . . *C. crepidater*
 — Preoral clefts short, the distance between their inner ends at least as great as the distance between the inner ends of the nostrils *C. owstoni*

Centrosymnus crepidater (Bocage and Capello 1864)

Centrophorus crepidater Bocage and Capello 1864: 260 (type locality: Portugal).

Study material: 305 mm immature male (AMS I.15987-013) trawled from 549 m of water 48 km north-east of Jervis Bay, New South Wales (34°40'-35°01'S, 151°10-07'E), F.R.V. "Kapala", 7 July 1971; 338 mm immature male (AMS I.17868-003) trawled from 777 m off Sydney, New South Wales (33°40-43'S, 151°56-59'E), F.R.V. "Kapala", 6 December 1972.

The larger of these two specimens is illustrated here (Fig. 4) with the proportional dimensions summarized (Table 1). The colour (in alcohol) is a uniform dark brown. The denticles are typical of young *Centrosymnus*; larger sharks have denticles similar to those illustrated for *C. owstoni* (Fig. 5C, see also Garrick, 1959a, fig. 4). Both specimens had 75 precaudal vertebrae with 54 (338 mm male) and 55 (305 mm male) monospondylous vertebrae. The caudal vertebrae were insufficiently calcified to make clear images on radiographs. Tooth numbers were 36/16-1-16 (338 mm male) and 37/16-1-16 (305 mm male).

Centrosymnus owstoni Garman 1906

Centrosymnus owstoni Garman 1906: 207 (type locality: Japan).

Study material: 440 mm female (AMS IB.5327) trawled from 823 m of water east of Eden, New South Wales (37°04'S, 149°55'E), J. Henry, 29 August 1961 (in poor

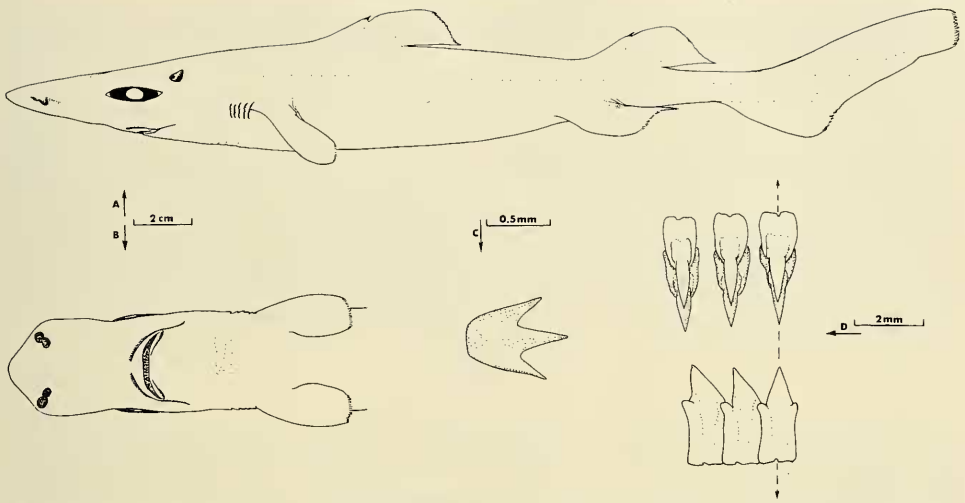


Fig. 4. 338 mm immature male *Centroscyrnus crepidater* (AMS I.17868-003). A — lateral view, B — ventral view, C — denticle from side below first dorsal fin, D — teeth from right side of upper jaws. Dashed line indicates position of symphyses.

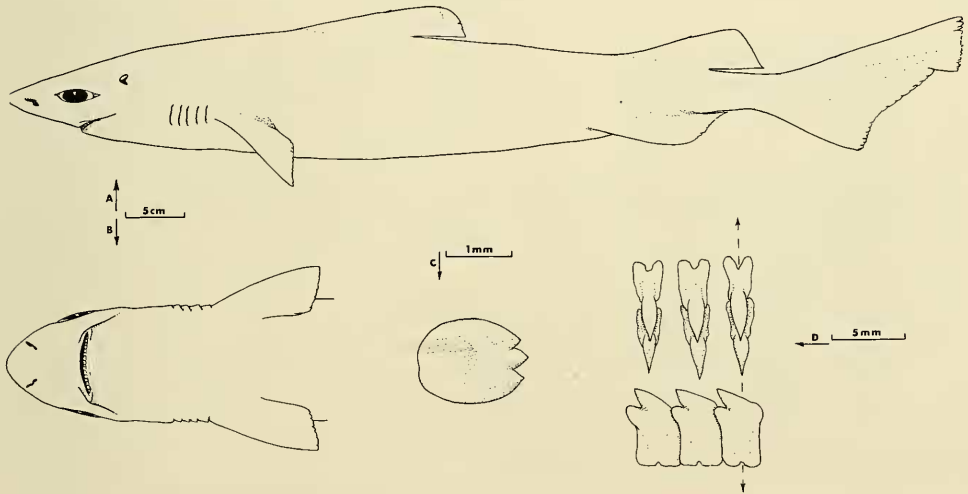


Fig. 5. 975 mm mature female *Centroscyrnus owstoni* (AMS I.16147-001). A — lateral view, B — ventral view, C — denticle from side below first dorsal fin, D — teeth from right side of upper jaws. Dashed line indicates position of symphyses.

condition); 975 mm mature female (AMS I.16147-001) trawled off Sydney, New South Wales (151°E, 33°S), F.R.V. "Kapala", August 1971.

The 975 mm female is illustrated (Fig. 5) with the proportional dimensions summarized (Table 1). Many of the differences in proportions between this mature shark and the immature *C. crepidater* illustrated in Fig. 4 are due to growth changes rather than specific differences. Trends in the changes of proportional dimensions with growth in squaloid sharks are summarized by Garrick (1960). The colour (in alcohol) is a uniform dark brown. Vertebrae numbered 57 monospondylous in a precaudal total of 75 (caudal vertebrae not counted). The teeth numbered 37/17-1-17.

The smaller of these two specimens of *C. owstoni* was identified as *Scymnodon plunketi* Waite 1910 by Whitley (as noted in the Australian Museum fish register). *S. plunketi* had previously been recorded from south-eastern Australia by Cowper and Downie (1957) together with *Centroscyrnus waitei* (Thompson 1930). Garrick (1959b) has since shown that *C. waitei* is the juvenile of *S. plunketi*. The specimens noted by Cowper and Downie included *Centrophorus squamosus* (Bonnaterre 1788), *Centroscyrnus owstoni* and one shark which probably was *S. plunketi* (pers. comm., J. A. F. Garrick). *S. plunketi* could well appear in catches of deepwater sharks from Australian seas. Apart from the tooth and denticle characters noted in the generic key above, it is readily distinguished from *C. crepidater* and *C. owstoni* by a shorter snout tip (distance between inner ends nostrils about $1\frac{1}{2} \times$ that from tip of snout to inner ends nostrils in *S. plunketi*, about equal in *C. crepidater* and *C. owstoni*).

ACKNOWLEDGEMENTS

For specimens, help, advice and hospitality I would like to thank Dr John Paxton, Dr Doug Hoese, Dianne Blake and Helen Larson of the Australian Museum as well as Dr Gerry Allen, Barry Hutchins and Neil Sarti of the Western Australian Museum and Dr Jack Garrick of the Victoria University of Wellington. Many of the specimens were obtained through the good services of Terry Gorman, Ken Graham and the crew of the F.R.V. "Kapala" of the New South Wales State Fisheries.

References

- BASS, A. J., D'AUBREY, D. D., and KISTNASAMY, N., 1975a. — Sharks of the east coast of southern Africa. III. The families Carcharhinidae (excluding *Mustelus* and *Carcharhinus*) and Sphyrnidae. *Invest. Rep. oceanogr. Res. Inst.*, (38) : 1-100.
- , 1975b. — Sharks of the east coast of southern Africa. V. The families Hexanchidae, Chlamydoselachidae, Heterodontidae, Pristiophoridae and Squatinidae. *Invest. Rep. oceanogr. Res. Inst.*, (43) : 1-50.
- , 1976. — Sharks of the east coast of southern Africa. VI. The families Oxynotidae, Squalidae, Dalatiidae and Echinorhinidae. *Invest. Rep. oceanogr. Res. Inst.*, (45) : 1-103.
- COWPER, T. R., and DOWNIE, R. J., 1957. — A line-fishing survey of the fishes of south-eastern Australian continental slope. *C.S.I.R.O. Aust. Div. Fish. oceanogr. Rep.*, (6) : 1-19.
- FORSTER, G. R., and collaborators, 1970. — Results of the Royal Society Indian Ocean Deep Slope Fishing Expedition, 1969. *Proc. R. Soc. Lond.*, B, 175 : 367-404.
- GARRICK, J. A. F., 1959a. — Studies on New Zealand Elasmobranchii. Part VIII — Two northern hemisphere species of *Centroscyrnus* in New Zealand waters. *Trans. R. Soc. N.Z.*, 87 (1/2) : 75-89.
- , 1959b. — Studies on New Zealand Elasmobranchii. Part IX — *Scymnodon plunketi* (Waite, 1910), an abundant deep-water shark of New Zealand waters. *Trans. R. Soc. N.Z.*, 87 (3/4) : 271-282.
- , 1960. — Studies on New Zealand Elasmobranchii. Part XII — The species of *Squalus* from New Zealand and Australia; and a general account and key to the New Zealand Squaloidea. *Trans. R. Soc. N.Z.*, 88 (3) : 519-557.
- , and PAUL, L. J., 1971a. — *Heptranchias dakini* Whitley, 1931, a synonym of *H. perlo* (Bonnaterre, 1788), the sharpnouted or perlon shark, with notes on sexual dimorphism in this species. *Zoology Pubs Vict. Univ. Wellington*, (54) : 1-14.
- , 1971b. — *Cirrhigaleus barbifer* (fam. Squalidae), a little known Japanese shark from New Zealand waters. *Zoology Pubs Vict. Univ. Wellington*, (55) : 1-13.
- LYNCH, D. D., 1964. — First Australian record of *Hexanchus griseus* (Bonnaterre) 1780. The six-gilled shark. *Mem. Nat. Mus. Vict.*, 26 : 259-261.
- PHILLIPPS, W. J., 1946. — Sharks of New Zealand. *Rec. Dominion Mus.*, 1 (2) : 5-20.
- PINCHUK, V. I., and PERMITIN, YE. YE., 1970. — New data on dogfish sharks of the family Squalidae in the south-eastern Atlantic. *J. Ichthyol*, 10 (3) : 273-276.
- ROEDEL, P. M., and RIPLEY, W. E., 1950. — California sharks and rays. *Fish. Bull. Calif.*, (75) : 1-88.
- SMITH, J. L. B., 1967. — The lizard shark, *Chlamydoselachus anguineus* Garman, in South Africa. *Occ. Pap. Dep. Ichthyol. Rhodes Univ.*, (10) : 105-114.
- STEAD, D. G., 1907. — In "Notes and Exhibits". *Proc. Linn. Soc. N.S. Wales*, 32 : 554.
- , 1963. — *Sharks and rays of Australian seas*. Sydney: Angus & Robertson.
- WHITLEY, G. P., 1940. — *The fishes of Australia*, part 1. *The sharks, rays, devil fish, and other primitive fishes of Australia and New Zealand*. Sydney: Royal Zoological Society of New South Wales.